Original Article

FREQUENCY OF PERCUTANEOUS ACHILLES TENOTOMY IN THE TREATMENT OF IDIOPATHIC CLUBFOOT USING THE PONSETI METHOD.

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ABSTRACT

Background: Percutaneous Achilles tenotomy is an integral component of congenital clubfoot treatment using the Ponseti method. This study was designed to assess the frequency and outcome of percutaneous Achilles tenotomy in the conservative treatment of congenital clubfoot by the Ponseti method.

Patients and methods: A prospective study of all congenital clubfoot patients between the ages of zero and two years who attended our clubfoot clinic between January, 2013 and December, 2017 was carried out. At presentation, each clubfoot was assessed clinically and scored using the Pirani scoring system, and treated using the Ponseti method. Percutaneous Achilles tenotomy was performed for feet with persistent equinus deformity. Statistical analysis of the distribution and associations of percutaneous Achilles tenotomy was done using IBM SPSS version 22 was done.

Results: A total of 97 patients with 147 clubfeet were studied. The median total Pirani score (TPS), midfoot contracture score (MFCS) and hindfoot contracture score (HFCS) at presentation were 4.5, 2.5 and 2.5 respectively. Percutaneous Achilles tenotomy was performed on 97 (66.4%) feet belonging to 63 patients. Eighty five out of 108 feet with initial total Pirani score of 3.0 and above required percutaneous Achilles tenotomy to achieve correction ($p < 0.001$).

Conclusion: Treatment of congenital clubfoot using the Ponseti method was associated with a tenotomy rate of 66.4%. High Pirani scores as well as increasing age at presentation were associated with the need for percutaneous Achilles tenotomy.

Keywords: Congenital, Clubfoot, Pirani scoring system, Ponseti method, Achilles tenotomy

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INTRODUCTION

Congenital clubfoot has been largely reported as the commonest congenital deformity of the lower limb with an incidence of approximately 1 in 1,000 life births.[1,2] Conservative treatment by serial manipulation and cast application as described by Ponseti[3] has gained popularity amongst orthopaedic surgeons across the globe.[4-6] Using this method, high success rates have been reported by various authors in the literature.[7-11]

Percutaneous Achilles tenotomy is an integral component of the Ponseti method of clubfoot treatment.[12, 13] It is a very safe and relatively simple procedure that is usually required for correcting persistent equinus deformity following correction of forefoot and midfoot deformities.[4,7,12] Figures ranging from 60% to over 90% have been reported in the literature as the frequency of percutaneous Achilles tenotomy.[6,14–16]

Percutaneous Achilles tenotomy is largely carried out in clubfoot clinics under local anaesthesia. Few complications including bleeding due to injury to the peroneal artery, posterior tibial artery, or lesser saphenous vein as well as injury to the tibial or sural nerves, and incomplete release have been reported.[4, 7, 12, 14] Percutaneous Achilles tenotomy under general anesthesia offers the potential advantages of better pain control, the ability to perform the procedure

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in a more controlled manner, and the possibility of lessening the pain response of the infant as well as reducing the risk of complications. However, concerns regarding the safety of general anesthesia in infants remain an issue.[1]

Achilles tendon has been shown to regenerate following percutaneous tenotomy as part of treatment of congenital clubfoot using the Ponseti technique.[18] Excellent functional outcome in terms of gait analysis following percutaneous Achilles tenotomy has been reported[19]. Also, the functional outcome of congenital clubfeet that had inadvertent complete Achilles tenotomy was indistinguishable from those in whom tendon continuity was maintained following percutaneous Achilles tendon lengthening.[20]

This study was designed to assess the frequency and pattern of percutaneous Achilles tenotomy in the conservative treatment of congenital clubfoot by the Ponseti method.

PATIENTS AND METHODS

A prospective study of all patients with idiopathic clubfoot, who attended our clubfoot clinic between January, 2013 and December, 2017 was carried out. Patients with syndromic clubfeet as well as those with idiopathic clubfeet who had been treated prior to presentation were excluded from the study. Patients above 2 years of age were also excluded from the study.

At presentation, each clubfoot was assessed clinically and scored using the Pirani scoring system. Each foot was treated conservatively by serial manipulation and cast application using the Ponseti protocol. Percutaneous Achilles tenotomy was performed for feet with persistent equinus deformity following correction of forefoot component deformities, prior to the application of the final cast.

The percutaneous Achilles tenotomy sites were assessed after 3 weeks following removal of the final cast. Also, assessment of passive dorsiflexion as well as clinical scoring of all treated feet using the Pirani system were done and recorded. Correction was subsequently maintained with locally produced Steenbeek foot abduction brace, while patients' follow–up was extended beyond the period of this study.

RESULTS

A total of 97 patients (56 Male, 41 Female) with 147 clubfeet (23 Right, 24 Left and 50 Bilateral) were studied. See figure I. Patients were aged between 0 month and 24 months at presentation. Majority (n=81; 83.5%) of the patients were 6 months or less. Patients with bilateral deformity (n=28; 56.0%) were predominantly male. See Table I. The median total Pirani score (TPS), midfoot contracture score (MFCS) and hindfoot contracture score (HFCS) at presentation were 4.5, 2.5 and 2.5 respectively.

Figure 1: Distribution of gender and laterality of deformity.

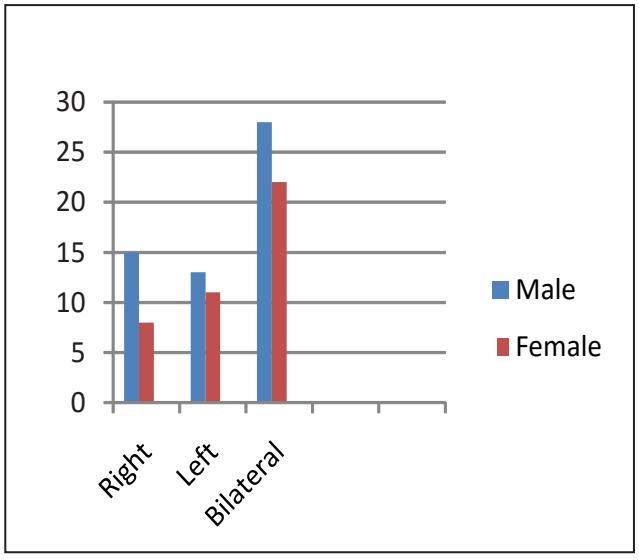


Table 1: Distribution of age and gender of patients.

Variable	Male	Female	Total
Age (Months)			
0 – 6	51 (63.0%)	30 (37.0%)	81 (100%)
7 - 12	2 (16.7%)	10 (83.3%)	12 (100%)
13 – 18	2 (100%)	0 (0)	2 (100%)
19 – 24	1 (50.0%)	1 (50.0%)	2 (100%)
Laterality			
Right	15 (65.2%)	8 (34.8%)	23 (100%)
Left	13 (54.2%)	11 (45.8%)	24 (100%)
Bilateral	28 (56.0%)	22 (44.0%)	50 (100%)

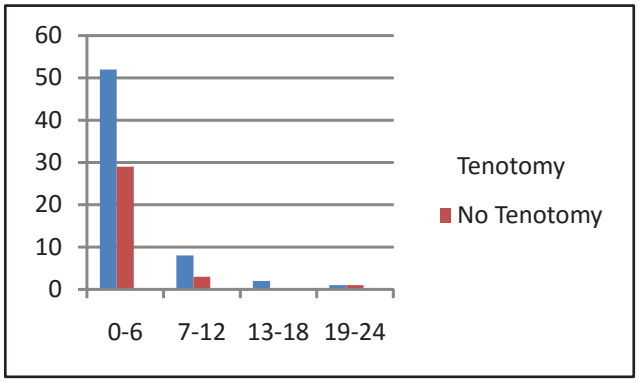
Percutaneous Achilles tenotomy was performed on 97 (66.4%) feet belonging to 63 patients, with median TPS, MFCS and HFCS of 4.5, 2.5 and 2.5 respectively. However, for feet which did not require percutaneous tenotomy, the median TPS, MFCS and HFCS were 2.5, 1.5 and 1.5 respectively. Eighty five (78.7%) out of 108 feet with initial total Pirani scores of 3.0 and above required percutaneous Achilles tenotomy to achieve correction ($p < 0.001$). Eighty two (78.1%) out of 105 feet with initial midfoot contracture scores of 2.0 and above ($p < 0.004$), and 83 (78.3%) out of 106 feet with initial hind foot contracture scores of 2.0 and above ($p < 0.002$) required percutaneous Achilles tenotomy to achieve correction.

A slightly greater proportion of the male patients (67.9%) compared to that of the female patients (60.9%) required percutaneous Achilles tenotomy. See Table II. Also, a greater proportion of patients who were above 6 months at presentation (73.33%), compared to those who were 6 months and below (64.19%), required percutaneous Achilles tenotomy to achieve correction. See Figure II.

Table 2: Distribution of percutaneous tenotomy in relationship to Pirani score, gender and laterality of deformity.

Variables	Tenotomy	No Tenotomy	
Initial Total Pirani Score			
≤ 2.0	4	11	
2.5 - 4.0	18	23	
4.5 - 6.0	75	15	p<0.001
Gender			
Male	38	18	
Female	25	16	
Laterality			
Right	49	24	
Left	59	25	

Figure 2: Distribution of tenotomy across the age groups.



DISCUSSION

Percutaneous Achilles tenotomy has been widely described as an integral part of clubfoot treatment using the Ponseti method.[3,12,17] Although a few complications have been documented, percutaneous Achilles tenotomy is a very safe procedure.[6,7,17] In this study, no complication following percutaneous Achilles tenotomy was recorded. This outcome is the same as that reported by Argawal et al[7], who did not encounter any complication following percutaneous Achilles tenotomy in 58 clubfeet. Mini open Achilles tendon lengthening as a component of the Ponseti method as described by Mac Neille et al[14] offers the orthopaedic surgeon the advantage of operating under direct vision and better control, however, there is no difference in outcome when compared to percutaneous Achilles tenotomy.

Majority (n=81; 83.5%) of the patients in this study were 6 months or less at presentation. Out of this number, 29 (35.8%) patients did not have percutaneous Achilles tenotomy, as correction was achieved following serial manipulation and casting only (p=0.004). This might account for the relatively low Achilles tenotomy rate of 66.4% in this study compared to rates of 85% and above documented in the literature[3, 11, 19], suggesting a reduction in tenotomy rate with early presentation. No pattern for percutaneous Achilles tenotomy was established across gender and laterality of deformity (p=0.483).

At presentation, the median TPS, MFCS and HFCS were higher in the feet which later had percutaneous Achilles tenotomy as part of their treatment. A very strong relationship was established between TPS and percutaneous Achilles tenotomy (p<0.001), implying that the higher the TPS at presentation, the more likely it is that the foot would require tenotomy to achieve correction. HFCS (p=0.002) when compared to MFCS (P=0.04), showed a stronger relationship with percutaneous Achilles tenotomy. This suggests that HFCS which assesses the hindfoot components of the clubfoot including equinus deformity is a better predictor of the need for percutaneous Achilles tenotomy.

CONCLUSION

Percutaneous Achilles tenotomy is a very safe component of the Ponseti method of congenital clubfoot treatment. Its frequency can be predicted using the Pirani scores at presentation. Low Pirani scores as well as early presentation are associated with a reduction in the rate of percutaneous Achilles tenotomy.

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